About 1830 the cell-doctrine was accepted, so far as concerned the vegetable kingdom. That it was also applicable to animals, was stated by Dutrochet in 1824; but it remained for Schwann to prove in his classical treatise (1839) the correctness of this thesis. From that time the cellular theory may be regarded as definitely established. Its extension to the explanation of certain pathological processes by Goodsir (1845) and Virchow (1859) was a noteworthy advance.

All this time the definition of the cell, accepted at the time of Valentin's work, was undergoing modification. The protoplasm was discovered, and its fundamental importance recognized. Bit by bit the essential structure of cells was simplified, until now the term denotes nothing but an independent particle of protoplasm. This particle may have, and often has, a nucleus in it, and a cell-wall around it; but both may be absent, and the tiny mass live and grow and multiply. Such modifications, in our conceptions as to what parts are necessary to the construction of a cell, do not, however, in any way essentially alter the cell-doctrine: it still remains a fundamental truth, the basis of all morphology and physiology.

Of late years a vast number of important papers have appeared, dealing with the structure and the properties of cells. They are scattered over the pages of many journals, and written in many languages; and the time had come for some one to collect and unify them. A good summary of the more important results of the work of the past twenty years, and a bibliography, aiding those desiring more detailed information to find it in original sources, was a necessity. Canon Carnoy undertook this task; and, so far as the present fascicule of his treatise on the 'Cellular biology' goes, has performed it well. The instalment published contains two hundred and seventy-one pages, of which, however, only the final hundred deal directly with cells. The introductory pages contain an exposition of the objects and methods of education, which we heartily commend to all teachers of natural history; also directions in histological technique, which, for students of general biology, are more useful than those in any text-book of microscopy with which we are acquainted.

The subjects discussed in the final hundred pages are as follows: discovery of the cell and of its parts; elementary organisms; the cellular biology; protoplasm; the properties of living matter; the general structure of the cell, and its newer definitions; the structure and general composition of protoplasm and nucleus; the general laws of the cell; the structure and composition of the nucleus in detail. The last topic occupies more than sixty pages. and is of great value as bringing together in convenient form the main results of the many researches on nuclei made during the last ten years.

An important and gratifying feature of the book is that its illustrations are not only good, but new. It is difficult to express fully our gratitude for this: those who have been wearied by seeing the same veteran woodcuts dragged out once more for duty in each new text-book, will, however, appreciate the gladness with which we greet these new, and in most cases better ones.

While we heartily commend Canon Carnoy's book for its scientific merits, we think that it has another claim to the attention of all who are interested in the progress of human thought: it marks the close of an epoch. Written by a professor in a Catholic university, in a Catholic country, and utilizing and accepting as it does the results attained by the best biological workers and thinkers independently of all theological prejudice, it is a sign, among many, that modern biology has won its battle. There will still be occasional echoes of the struggle, and we may for some time to come meet such instances of persecution as that to which Professor Woodrow was recently subjected; but the war is over. The religious world in general recognizes daily with greater clearness that science is not necessarily irreligious; and that the conviction that our universe has been developed and is governed in accordance with immutable laws, is compatible with belief in an all-wise Law-giver.

LANGLEY'S WORK ON MOUNT WHITNEY.

FROM a scientific point of view, the 'Report of the Mount Whitney expedition of 1881' is unquestionably one of the most important volumes which has ever been issued by our government. It presents fully and clearly, not only the observations made upon the mountain, with their results, but also much of the preliminary work and discussion which showed the need of such an expedition, together with a description of the ingenious and delicate apparatus devised by Professor Langley for the investigation.

Researches on the solar heat, and its absorption by the earth's atmosphere. A report on the Mount Whitney expedition. By Prof. S. P. LANGLEY. Washington, *Government*, 1884. (Prof. papers U. S. signal serv., xv.) 242 p., illustr., 21 pl., map. 4°.

To a certain extent, the principal results have already been given in various papers read before the National academy of sciences, and printed more or less fully in the different scientific journals; but we now have, for the first time, the details of the observations and computations from which the results have been derived, and are put in possession of the facts necessary to a due appreciation of their weight.

The first of the twenty-one chapters of which the report consists, is occupied with the preliminary observations at Allegheny during 1880 and 1881, — observations which brought out clearly the fallacy of most of the methods and conclusions previously adopted, and the necessity of a careful series of observations at some elevated station.

The second chapter contains an account of the organization of the expedition under the auspices of the signal-service, and gives the story of the journey, with a description of the stations. It is made quite clear that Mount Whitney is a station every way adapted to the purposes for which it was selected; and every one interested in science will most sincerely join in the author's hope "that something more than a mere ordinary meteorological station will be erected here, and that the almost unequalled advantages of this site will be developed by the government."

The third chapter contains a brief historical summary of the actinometric work done by various observers previous to 1880. We miss in it, however, any allusion to the labors of Secchi, Rosetti, and Waterston.

The next five chapters are devoted to the pyrheliometric and actinometric observations made by the expedition, with all necessary details as to the apparatus and methods of reduction. Professor Langley condemns the pyrheliometer of Pouillet as liable to give a very inaccurate determination of the quantity of heat actually brought by a given sunbeam under given circumstances; and he appears to consider the globe actinometer of Violle as, on the whole, the best when the constants of the instrument have been determined with sufficient care. The summary of results in chapter ix. makes it very clear, however, that the mere inaccuracies of observation are not so prejudicial to the satisfactory determination of the 'solar constant' as the use, in the reductions, of the fallacious assumption that the amount of radiant energy transmitted through an imperfectly transparent medium is given by the long-accepted formula, $C = Ea^{\epsilon}$, in which E is the 'solar constant,' a a constant 'coefficient of transmission,' and ϵ the 'thickness' of the air-stratum through which the rays penetrate. To bring out this fallacy is one of the author's main objects; and he sets it in a striking light by certain comparisons, given on pp. 69 and 119, between the results obtained at Lone Pine and at Mountain Camp, eight thousand feet higher. We note, however, that, by a sort of impish perversity of typographical luck, 1.797 is printed for 1.707 on the ninth line of p. 119, making the printed figures egregiously contradictory of the conclusions asserted in the text.

The fallacy consists in neglecting the fact that the solar radiation is not homogeneous, and in assuming, that, while such is the fact, the formula given above is applicable, provided one determines with care a sort of mean value for a by the comparison of observations made at different altitudes of the sun. In chapter x. the author discusses the matter fully, and shows mathematically that *values of the solar constant, obtained by reducing, according to this formula, any possible actual observations, will inevitably be too small, and probably very much too small.*

Chapters xi., xii., and xiii. are taken up with the description of the special apparatus devised by the author to meet the difficulty, and with an account of the observations made with the spectrobolometer at Mount Whitney and Allegheny; other chapters are devoted to the 'transmissibility' of our atmosphere for light, and to sky and nocturnal radiation; and others yet, include an interesting summary and discussion of the hygrometric and barometric observations. The report proper closes with a general summary of results. As regards the 'solar constant' itself, the author's conclusion is, that "at the earth's mean distance, in the absence of its absorbing atmosphere, the solar rays would raise one gram of water *three* degrees Centigrade per minute for each normally exposed centimetre of its surface." According to this, the 'solar constant' is three (small) calories (gram degrees) per minute per square centimetre, — equivalent, of course, to thirty large calories (kilogram degrees) per minute per square metre. The hitherto received values range from twenty to twenty-five. Other results of great importance are also indicated, relating to the wave-length of 'dark-heat,' the theory of the maintenance of the earth's temperature by its overlying atmosphere, the amount of absorption by this atmosphere, and a number of other related subjects. We have not room to quote them, and they would better be read in their connection.

There are also three appendices, — the first relating to the reduction of the psychrometer observations, which, at the summit of the mountain, show certain considerable discordances; the second, on the experimental determination of wave-lengths in the invisible prismatic spectrum, — a paper already published elsewhere, but most appropriately reprinted in this connection; and, finally, an investigation of the effect of convection-currents upon the loss or gain of temperature by a thermometer-bulb.

There can be no question that Professor Langley's exposure of the fallacy of the earlier methods of investigating the solar radiation, and his invention of the spectrobolometer, will always be recognized as an epoch in the history of the subject; and in the volume before us we have the best available summing-up of the matter.

It would be unjust to close this notice without an allusion to a fact which is well and gracefully stated in Gen. Hazen's brief preface: "It should be said that the aid given to Professor Langley [by the signal-service], which he so gracefully acknowledges in the text, was necessarily limited. A large part of the expense of the outfit was generously borne by a friend of the Allegheny observatory." To this anonymous friend, as well as to the signal-service and to Professor Langley himself, the thanks of all who are interested in science are due, and are hereby returned.

NOTES AND NEWS.

THE legislature of Wisconsin has appropriated a hundred and ninety thousand dollars to the University of Wisconsin, for rebuilding the science laboratories destroyed by fire on Dec. 1, 1884. The new buildings will consist of a chemical laboratory, a machine-shop, and a building for the departments of physics, engineering, geology, and zoölogy. All are to be fire-proof, or, more accurately, 'slow-burning,' buildings; and the heating-apparatus for all is to be placed in a separate structure. In addition to the above-named sum, the insurance on the former building, amounting to some forty thousand dollars, is appropriated for refitting the departments with necessary furniture and apparatus for immediate use. No appropriation for cabinets, etc., was urged, as the next legislature will meet before the completion of the new building. It is proposed to push the construction of the chemical laboratory and machine-shop as rapidly as possible. Since items have appeared, asserting that the Lapham herbarium was destroyed, it may be stated that the herbarium was not in Science hall, and is consequently intact.

— In their report on Edison's autographic telegraph, the examiners of telegraphic apparatus at the Philadelphia electrical exhibition write, "It was not set up in such manner that its construction or mode of operation could be examined, and we are therefore unable to report upon it. It may, perhaps, be proper to say that the autographic system for the transmission of communications in facsimile would seem to afford one of the most promising fields for the labors of future improvers of the telegraph. It is apparently in this direction, if any, that we must look for the future solution of the problem of cheap telegraphy. It will be readily understood that if an efficient system were invented by which the original message, as written by the sender, could be placed in a machine, and a facsimile of it instantly produced by the action of electricity at a distant station, and this by automatic machinery without the intervention of human hands, the actual cost of performing the service would be but the merest trifle. Yet there is apparently no obstacle in the way of obtaining this result, which we may not hope to see overcome sooner or later by the genius and perseverance of our inventors."

— The Leander McCormick observatory of the University of Virginia was inaugurated on April 13; the ceremonies taking place in the public hall of the institution, and Professor Asaph Hall of the naval observatory, Washington, delivering the address. The principal instrument is the great Clark refractor of twenty-six inches' aperture. The observatory has a house adjoining for the director, Professor Stone, and is possessed of a considerable endowment fund, the gift of Mr. W. H. Vanderbilt of New York.

— Capt. Thompson of the schooner R. Bowers reports that on June 4, 1884, in latitude 42° 46′ north, longitude 60° 47′ west, a sealed bottle, inside of which was placed a record of their voyage, was thrown overboard. The bottle, with record, was picked up on July 15, 1884, at Little Dover Bay, east point of Nova Scotia.

— A pamphlet has been issued by Dr. John S. Billings, the secretary-general of the International medical congress, to be held in Washington in 1887, giving the rules for the congress, and a provisional list of officers.

— The circular of the summer school of languages at Amherst for the coming session, exhibits an enlargement of the methods and aims of the school, and an increase in the number of subjects taught and of teachers demanded, which, a few years back, any one would have been thought over-sanguine to predict. The growth of the school seems to indicate plainly that it has created a demand for itself, and that its management is meeting the necessities of the case in a satisfactory manner. Professor Montague, of the department of modern languages in Amherst college, is the director of the school: and he has the immediate co-operation, in German, of Professor Zuellig, now an instructor at Princeton; in French, of Professor Bernard of Boston; in Latin, of Professor Johnson of Lehigh university; and in Hebrew, of the well-known specialist, Dr. Haley. Thirteen other instructors in language are also announced; and the generosity of the officers of the college in